Feasibility Study of 3D-Printed Surgical Simulation Model for Eye Bank Technician Training

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Financial Disclosures

• We have no relevant financial disclosures.
Background

- Potential for a human tissue alternative in the setting of training and evaluation of in-situ recovery technicians was identified.

Image courtesy of BIONIKO
Purpose

• To assess a prototype of the BIONIKO ‘Cordelia’ (BC) Model

Image courtesy of BIONIKO
Methods

Four successive iterations of a 3D-printed corneoscleral model were evaluated for suitability in technician training. Training experience evaluated based on the following factors:

- Pliability
- Rigidity
- Form
- Instrument Access
- Similarity to human tissue experience
- Consistency throughout product
Methods: Model Overview

1. Scleral layer
2. Choroid layer
3. Limbus
4. Supra-choroidal space
5. Spur
6. Cornea
7. Iris
8. Structural ring
9. Notch

Image courtesy of BIONIKO
Methods: Recovery Procedure

BIONIKO CORDELIA
DEMONSTRATION
Results

• Areas for improvement in the product were identified and addressed with each subsequent iteration.

• The final model yields similar results in all trials.
Results

- BC size/shape consistent with expected size/shape of human corneoscleral rim.
Results

- Available space/design does not allow for insertion of speculum; given that ‘eyelid’ is stationary, speculum deemed unnecessary. Ability to trephinate and excise in usable space satisfactory.
Results

- BC maintains cornea shape throughout process, outside setting of excessive pressure/pulling.
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- Simulated tissue, while noticeably dissimilar to human tissue, provides similar anatomical structures for evaluation. Trephination, separation of scleral spur, separation of choroid at limbus represented in a fashion comparable to human tissue.
Discussion

• The BC model allows for training and eval outside the donor setting – compares favorably to frozen tissue.
• No tracking of tissue- QA approved!
• Minimizes resources allocated to recovery.
• No risk of transmission from tissue.
• Allows for eval/observation of remote staff at any time, regardless of donor availability.
Training tissue is invaluable and is a necessary part of the process. A recovery simulation tool provides flexibility to the options we have to bring technicians up to speed and verify competency, without going through the recovery process.
Model Limitations

- No lids
- No lashes
- No conjunctiva
- No vitreous
- Soaking of the model changes pliability
New Additions

Slide added June 4, 2015
Discussion

• 3D printing lowers the barrier to incremental improvements in technology
• Limits to improvements are limited by our imaginations

Qindao Unique bioprinted cornea

www.3dprint.com
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